

Digital Elevation Model Creation from Stereo Image Data for Planetary Surfaces

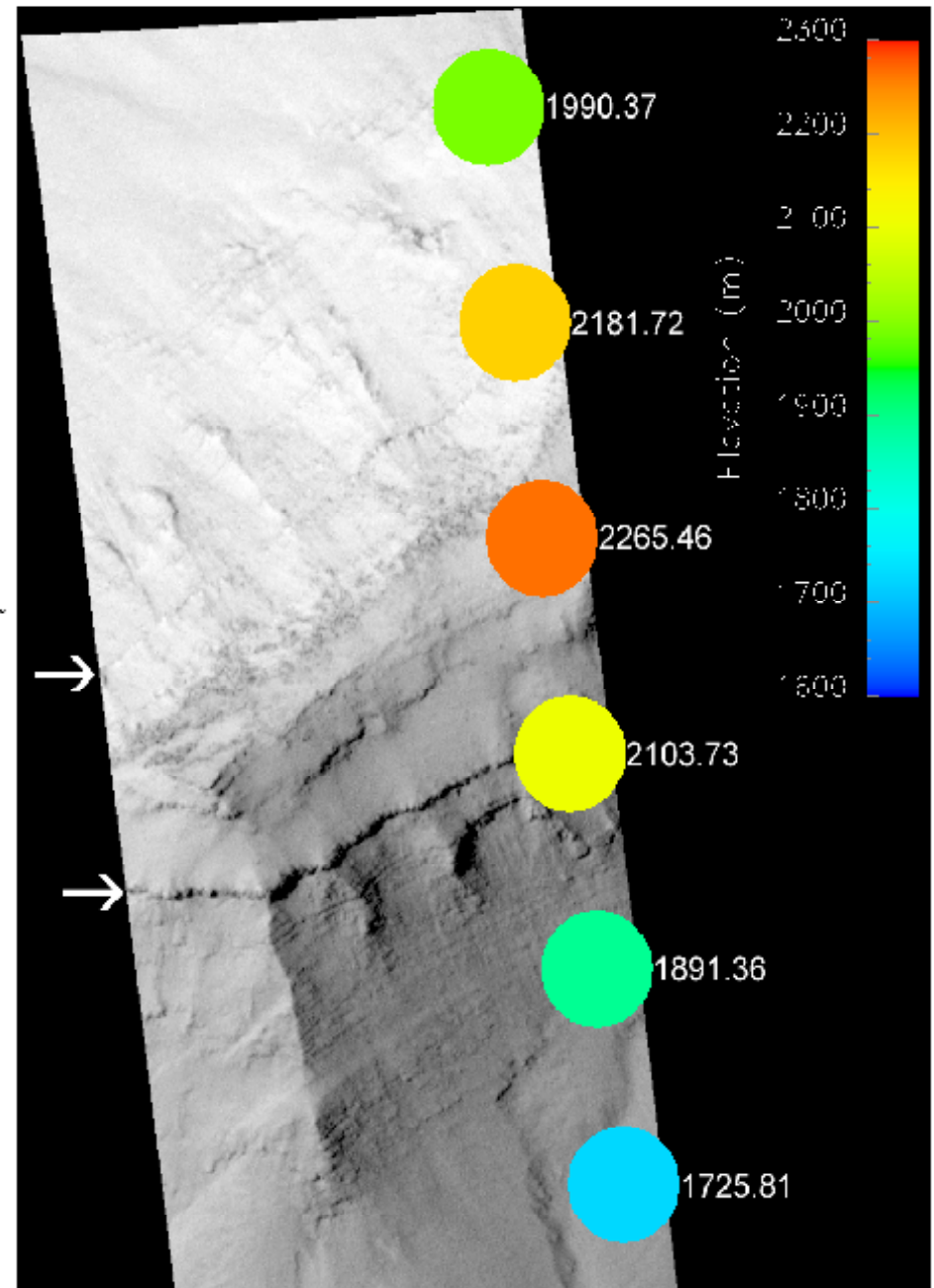
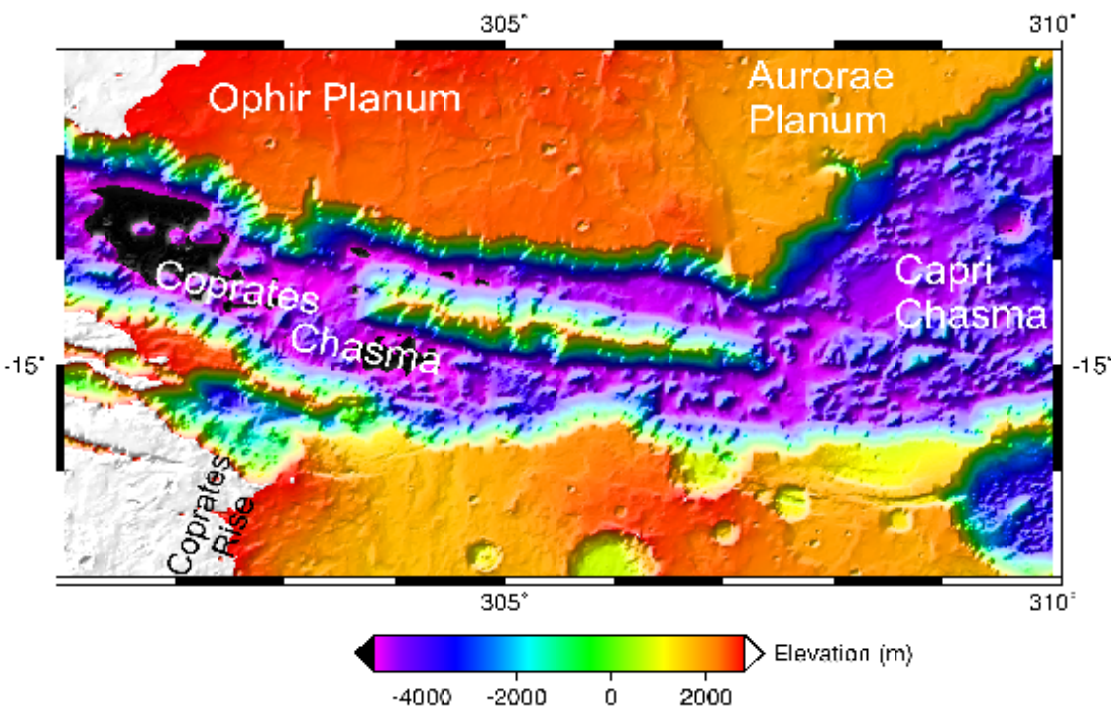
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Code SST

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Uses for high resolution Planetary Topo

- **Science examples**
 - terrestrial comparisons
 - understanding three-dimensional relationships
 - better knowledge of small-scale structure
 - etc.
- **Mission Planning examples**
 - Landing Site Selection
 - could drive instrument and rover design requirements

Laser Altimeter Limitations



How to get better topographic resolution?

- **Send More Instruments**
- **Exploit Existing Data**
 - Area Photoclinometry
 - Shape-from-shading
 - operates on a single image
 - lots of assumptions and limitations
 - Stereogrammetry
 - Requires at least two images
 - concept is straightforward

Stereo Components

- **Stereo Pair of Images**
 - View of same place from different angles
 - comparable resolutions
 - Reasonably abundant in the PDS, plans for more all the time
- **Finding Match Points**
 - By hand
 - auto-correlation
 - supervised auto-correlation
- **Camera Model**
 - Where is it, and which way is it pointed?
 - How do the optics affect the light path?
 - Complicated by modern push-broom imagers

Other Stereo Solutions

- **Commercial Solutions Exist, but are pricey**
- **A few solutions exist in the planetary community, but are kept close to the vest**
- **There must be others out there . . .**

Summary

- **Lots of Stereo Data exists**
- **There is a clear need for detailed planetary surface topography**
- **No simple cost effective way to create Digital Elevation Models from Stereo Data exists**